IDAHO CONTENT STANDARDS
HIGH SCHOOL TECHNICAL MATH
MATHEMATICS

Technical Math uses problem situations, physical models, and appropriate technology to extend mathematical thinking and engage student reasoning. Problem solving situations, including those related to a variety of careers and technical fields will provide all students an environment which promotes communication and fosters connections within mathematics to other disciplines and to the technological workplace. Students will use hands-on activities to model, explore, and develop abstract concepts. The use of appropriate technology will help students apply math in an increasingly technological world. Collaboration between math and professional-technical teachers is an integral part of this course.

Completion of Algebra I is <u>strongly</u> recommended before taking this course. If Algebra I is not taken prior to this course, Algebra I objectives (displayed in the box) will need to be taught. Otherwise, Algebra I objectives may simply be reviewed. Technical Math is intended to fulfill the requirement for a 3rd year of math, taken in the senior year. The standards include the knowledge that students need to know in order to enter a credit bearing math class at the college level.

* Designates Geometry Standards

<u>**Standard 1**</u>**: Number and Operation**

Goal 1.1: Understand and use numbers.

Objective(s): By the end of Technical Math, the student will be able to:

TM.1.1.1	Apply properties of rational numbers. (eg. necessary skill for applying numbers)
TM.1.1.2	Perform operations using positive and negative numbers, fractions, absolute value, decimals, percentages, and scientific notation. (eg. given the cost of a project, determine what percentage of the budget went for salaries)
TM.1.1.3	Apply properties of exponents. (eg. calculate the power dissipated by a resistor when its current and voltage drop are given in exponent form)
TM.1.1.4	Identify perfect squares and their principal roots. (eg. 4, 9, and 16 are perfect squares and their respective roots are 2, 3, and 4)
TM.1.1.5	Solve problems using number theory concepts. (eg. given initial expenses, money needed for reserve and start-up inventory, calculate the start up costs for a business by using a Starting Cost Calculator)
TM.1.1.6	Estimate the value of an irrational number expressed as a radical. (eg. calculate the impedance of an inductive series circuit when given the circuit's total resistance and total inductive reactance)

TM.1.1.7	Apply properties of common and natural logarithms. (eg. determine medication absorption rate)
TM.1.1.8	Use Fundamental Counting Principles. (eg. calculate number of outfits from set number of separates)

TM.1.1.9   Use combinations and permutations. (eg. calculate the number of ways to order the digits for a phone number)

Goal 1.2: Understand and perform computations accurately.

Objective(s): By the end of Technical Math, the student will be able to:

TM.1.2.1   Perform fundamental rational expression and number operations that involve a variety of applications. (eg. determine wage and benefits)

TM.1.2.2   Read, write, and solve problems using scientific notation. (eg. determine voltage of a circuit)

TM.1.2.3   Solve problems using direct and inverse variation. (eg. determine the mechanical advantage of gears)

TM.1.2.4   Perform operations on complex numbers. (eg. find amperage of current, knowing voltage and impedance if the impedance includes inductors or capacitors)

TM.1.2.5   Calculate nth powers and nth roots. (eg. compute interest on investments)

Goal 1.3: Estimate and judge reasonableness of results.

Objective(s): By the end of Technical Math, the student will be able to:

TM.1.3.1   Estimate square roots between consecutive integers. (eg. necessary foundation information)

TM.1.3.2   Determine relative and percent of error. (eg. scale drawings must be within (+,-) $1/16^{th}$ of an inch)

TM.1.3.3   Apply number sense to everyday situations. (eg. approximate grocery totals)

Standard 2: Concepts and Principles of Measurement

Goal 2.1: Understand and use U.S. customary and metric measurements.

Objective(s): By the end of Technical Math, the student will be able to:

TM.2.1.1   Perform metric conversions within the system. (eg. convert medicine dosage from adult to child)

TM.2.1.2   Solve problems by converting between English and metric systems. (eg. trip planning from miles to kilometers and gallons to liters)

*TM.2.1.3   Determine length, distance, area, surface area, volume, and weight, with appropriate unit labels. (eg. determine number of flowers needed to fill a flower bed)

*TM.2.1.4   Calculate circumference, area, radius, diameter, area of sector, arc length of a circle with appropriate unit labels. (eg. develop a circular watering system)

Goal 2.2: Apply the concepts of rates, ratios, and proportions.

Objective(s): By the end of Technical Math, the student will be able to:

TM.2.2.1   Determine an unknown term in a ratio. (eg. comparing cost of living between cities)

Goal 2.3: Apply dimensional analysis.

Objective(s): By the end of Technical Math, the student will be able to:

TM.2.3.1 Solve U.S. customary weights and measures problems using dimensional analysis. (eg. feet per second to miles per hour)

TM.2.3.2 By use of estimation convey knowledge of volume versus mass. (eg. determine dosage of medicine per weight)

Goal 2.4: Apply appropriate techniques, tools, and formulas to determine measurements.

Objective(s): By the end of Technical Math, the student will be able to:

*TM.2.4.1 Determine and use appropriate units. (eg. using an existing recipe, calculate a recipe for a larger group, simplify and label new amounts)

*TM.2.4.2 Calculate area, surface area for two dimensional objects and volume for three-dimensional objects. (eg. compute amount of cement needed for a sidewalk; calculate the cost of heating a building based on square footage)

<u>**Standard 3**</u>**: Concepts and Language of Algebra and Functions**

Goal 3.1: Use algebraic symbolism as a tool to represent mathematical relationships.

Objective(s): By the end of Technical Math, the student will be able to:

TM.3.1.1	Represent mathematical relationships using variables, expressions, linear equations and inequalities. (eg. using spreadsheet functions, determine sale price of items)

TM.3.1.2 Perform operations on polynomial expressions. (eg. compute regular and overtime gross and net earnings)

TM.3.1.3 Perform operations on radical expressions. (eg. determine flow rate of water through a fire hose)

TM.3.1.4 Perform operations on rational expressions. (eg. determine earnings for a given time frame)

TM.3.1.5 Factor quadratics and other polynomial expressions. (eg. determine flight time of a rocket)

TM.3.1.6 Represent application problems as linear equations. (eg. level of education versus pay; rate of speed versus fuel consumption; caloric intake versus expenditure)

Goal 3.2: Evaluate algebraic expressions.

Objective(s): By the end of Technical Math, the student will be able to:

TM.3.2.1 Perform fundamental operations on polynomial expressions. (eg. calculate the total cost of various items within a meal)

Goal 3.3: Solve algebraic equations and inequalities.

Objective(s): By the end of Technical Math, the student will be able to:

TM.3.3.1	Find solutions to simple quadratic equations. (eg. calculate water content of soil based on its weight)

TM.3.3.2 Solve exponential equations. (eg. determine atmospheric pressure)

TM.3.3.3	Solve logarithmic equations. (eg. determine power of a satellite needed to transmit signals)
TM.3.3.4	Solve absolute value equations. (eg. stopping distance of a car)
TM.3.3.5	Solve systems of inequalities in two variables. (eg. determine needed sales for a company given overhead)
TM.3.3.6	Solve basic one and two step rational equations. (eg. determine amount of medication to administer based on packaging size)

Goal 3.4: Solve simple linear systems of equations.

Objective(s): By the end of Technical Math, the student will be able to:

| TM.3.4.1 | Solve a system of two linear equations in an application setting. (eg. child care facility – sq. footage to number of children; solving electrical current in a circuit with multiple paths) |

Goal 3.5: Understand the concept of functions.

Objective(s): By the end of Technical Math, the student will be able to:

TM.3.5.1	Determine whether a relation is a function given graphs, charts, ordered pairs, mappings, or equations. (eg. graph the distance a ballistic device travels at different angles and determine if the data is a function of the angle)
TM.3.5.2	Differentiate between linear and non-linear functions and graphs. (eg. differentiate between a thrown object and the distance a car travels)
TM.3.5.3	Identify domain and range for given graphs, charts, ordered pairs, mappings, or linear functions. (eg. constraints of any situation such as a budget)

| TM.3.5.4 | Evaluate functions. (eg. work with the function $V=I*R$ and solve for different I and R) |

Goal 3.6: Apply functions to a variety of problems.

Objective(s): By the end of Technical Math, the student will be able to:

TM.3.6.1	Model real-world phenomena with linear functions. (eg. graph fuel consumption versus speed)
TM.3.6.2	Use graphs and tables to represent and solve problems. (eg. stress test of cardiovascular system)
TM.3.6.3	Solve application problems by isolating a specific variable in a formula and then substituting values. (eg. determining interest rate on a loan)

Standard 4: Concepts and Principles of Geometry

Goal 4.1: Apply concepts of size, shape, and spatial relationships.

Objective(s): By the end of Technical Math, the student will be able to:

*TM.4.1.1   Identify and apply congruency and similarity of two-dimensional figures. (eg. compare trusses or wall panels)

*TM.4.1.2   Identify the scale factor of similar three-dimensional figures and find the ratios of their surface areas and volumes. (eg. compare blueprint to actual model)

*TM.4.1.3   Use transformational geometry to rotate, translate, and reflect figures in a coordinate plane. (eg. flip a house plan)

TM.4.1.4   Describe and apply magnitude and direction of vectors. (eg. determine resultant direction due to wind)

Goal 4.2 Apply the geometry of right triangles.

Objective(s): By the end of Technical Math, the student will be able to:

TM.4.2.1   Understand and apply the Pythagorean Theorem for problem solving. (eg. checking accuracy on gate construction)

*TM.4.2.2   Identify and apply special right triangle relationships. (eg. isometric drawing in drafting)

*TM.4.2.3   Use right triangle trigonometry to solve right triangles. (eg. determine angle of elevation using sine, cosine and tangent)

TM.4.2.4   Use trigonometric ratios to solve problems. (eg. angle of depression)

Goal 4.3: Apply graphing in two dimensions.

Objective(s): By the end of Technical Math, the student will be able to:

*TM.4.3.1   Determine the length and midpoint of a segment in the coordinate plane. (eg. on-center carpentry from a blueprint would include the coordinate plane)

TM.4.3.2   Graph quadratic and absolute value functions. (eg. maximize profit from revenue)

TM.4.3.3   Graph exponential functions. (eg. rate of bacterial growth)

TM.4.3.4   Graph systems of equations and inequalities in two variables. (eg. mixing solutions for weed control)

Goal 4.4: Apply concepts of parallel lines.

Objective(s): By the end of Technical Math, the student will be able to:

TM.4.4.1   Identify the special angle pairs formed by parallel lines and a transversal. (eg. building a gate; designing a quilt)

TM.4.4.2   Apply the properties of special angle pairs formed by parallel lines and a transversal (eg. building a gate; designing a quilt)

Goal 4.5: Apply concepts of polygons.

Objectives: By the end of Technical Math, the student will be able to:

TM.4.5.1   Classify triangles and quadrilaterals based on their attributes. (eg. label triangles and quadrilaterals in a house plan)

*TM.4.5.2   Find the sum of the interior and exterior angles of a polygon. (eg. add the interior and exterior angles of a pentagonal swimming pool)

TM.4.5.3   Find the measure of each interior and exterior angle of a regular polygon. (eg. find the degree of angles to create a stop sign)

*TM.4.5.4   Determine whether or not a polygon is regular. (eg. design a hexagon table using a circle)

Goal 4.6: Understand basic concepts of a circle.

Objectives: By the end of Technical Math, the student will be able to:
TM.4.6.1   Identify the parts of a circle including radius, diameter, major/minor arcs, chords, secants and tangents. (eg. necessary foundation information)
TM.4.6.2   Determine the lengths of segments and the measures of angles formed by radii, chords, secants, and tangents. (eg. calculate trim for an arched window)

Goal 4.7: Apply Reasoning Skills.

No objectives for this course.

Goal 4.8: Represent and graph linear relationships.

Objectives: By the end of Technical Math, the student will be able to:
TM.4.8.1   Construct graphs and write equations and inequalities for linear relationships. (eg. relationship between cost and demand)
TM.4.8.2   Given a linear relationship, interpret the rate of change (slope) and the intercepts. (eg. rate of feed to fill a grain truck)
TM.4.8.3   Write equations of lines given various information including parallel, perpendicular, vertical, and horizontal lines. (eg. alignment of restaurant with layout of city street)
TM.4.8.4   Graph linear equations. (eg. constant increase in water temperature over time; monthly changes in sales)

Standard 5: Data Analysis, Probability, and Statistics

Goal 5.1: Represent data with a variety of formats.

Objective(s): By the end of Technical Math, the student will be able to:
TM.5.1.1   Analyze and interpret tables, charts and graphs. (eg. interpret a body mass index (BMI) chart)

Goal 5.2: Collect, organize, and display data.

Objective(s): By the end of Technical Math, the student will be able to:

TM.5.2.1   Graph scatter plots and informal trend lines. (eg. growth of state economy)
TM.5.2.2   Identify positive and negative correlations. (eg. vehicle depreciation)
TM.5.2.3   Collect, organize, and display data in tables, charts and graphs. (eg. chart change in stock values over 4 weeks)

Goal 5.3: Apply simple statistical measurements.

Objective(s): By the end of Technical Math, the student will be able to:

TM.5.3.1	Make predictions and draw conclusions based on statistical measures. (eg. predict the number of new jobs based on growth in population; predict the number of sunny days in a given area for a given time frame)

Goal 5.4: Understand basic concepts of probability.

No objectives at this course level

Goal 5.5: Make predictions or decisions based on data.

Objective(s): By the end of Technical Math, the student will be able to:

TM.5.5.1   Make predictions based on randomness, chance, equally likely events, and probability. (eg. predict the likelihood of having an accident using past accident data)

TM.5.5.2   Use data to predict the chance of an event. (eg. calculate the odds of a hit based on the batting average)